

Meeting the Future: Developing A Sustainability Research Strategy

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International Workshop

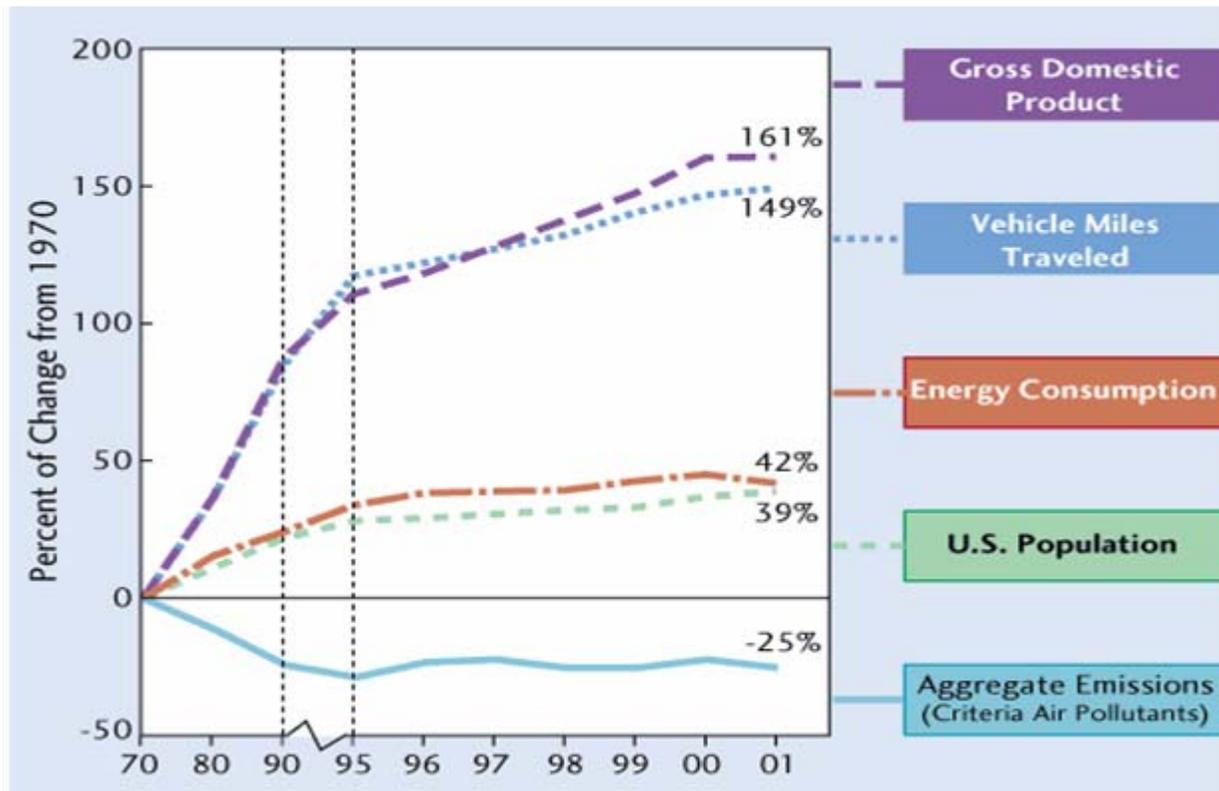
Washington, D.C.

May 18, 2005

Reminder of the Past: Cuyahoga River, Ohio – November 4, 1952



Growing the Economy and Stabilizing Emissions, 1970-2001



Source: EPA Office of Air Quality Planning and Standards. *Latest Findings on National Air Quality: 2001 Status and Trends*. September 2002.



Long-term perspective shows serious challenges: Today + 50 years

- Economy: + 500%
- Population: + 50%
- Energy and Manufacturing: + 300%

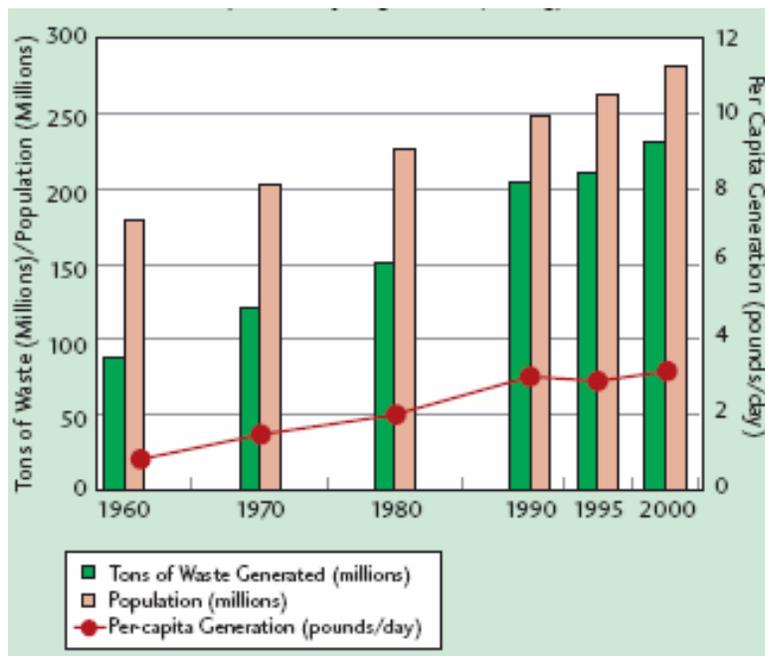
– World Resources Institute, *The Weight of Nations*, 2000



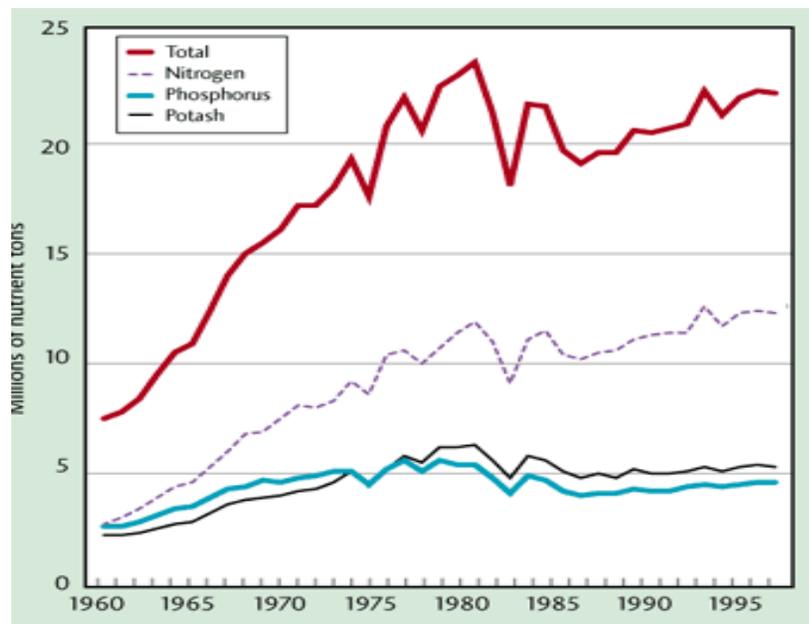
Sustainability Management aims to ...

Reduce stressors on the environment

Municipal Solid Waste, 1960-2000
(before recycling and composting)



Use of Fertilizer, 1960-98



Sustainability Management aims to ...

Anticipate and address emerging issues

- Nanotechnology
- Pharmaceuticals and personal care products
- Endocrine disruptors
- Perchlorate, TCE, flame retardants

Sustainability Management aims to ...
Make environmental compliance
cost-effective

- Total regulatory costs were 3.7 percent of U.S. GDP in 2003.
- About half of this amount represents compliance with environmental regulations.

Office of Management and Budget, Office of Information and Regulatory Affairs,
Report to Congress on the Costs and Benefits of Federal Regulations,
September 2003.



EPA's sustainability research builds the underlying knowledge to support...

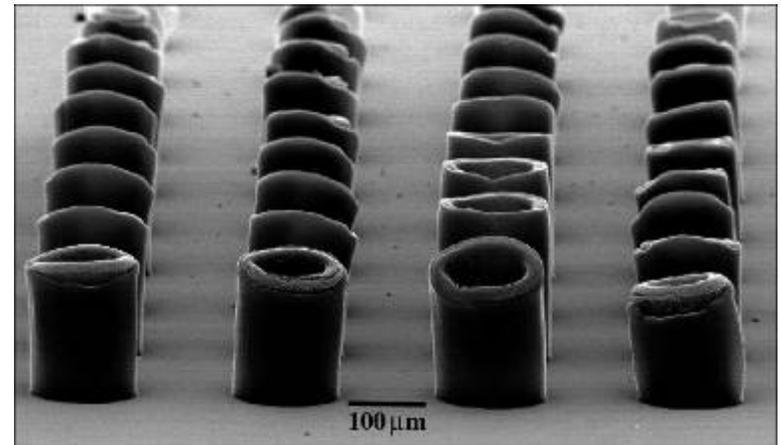
- Identifying **emerging environmental issues**, applications and implications of new technologies
- Assisting states, cities, industries, and consumers with sustainable design, development, and management by creating **decision-making tools and technologies**
- Tracking progress through **indicators**
- Developing market- and incentive-based **policy for sustainable development**



Assessing Benefits and Risk of Emerging Issues

“Nanotechnology has given us the tools...to play with the ultimate toy box of nature—atoms and molecules. Everything is made from it...The possibilities to create new things appear limitless.”

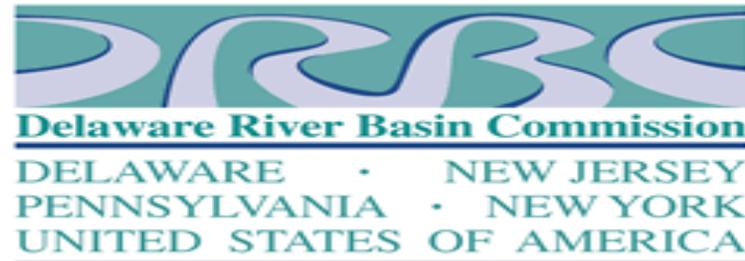
– Horst Stormer Lucent Technologies and Columbia University, Physics Nobel Prize Winner



Assisting States and Cities...

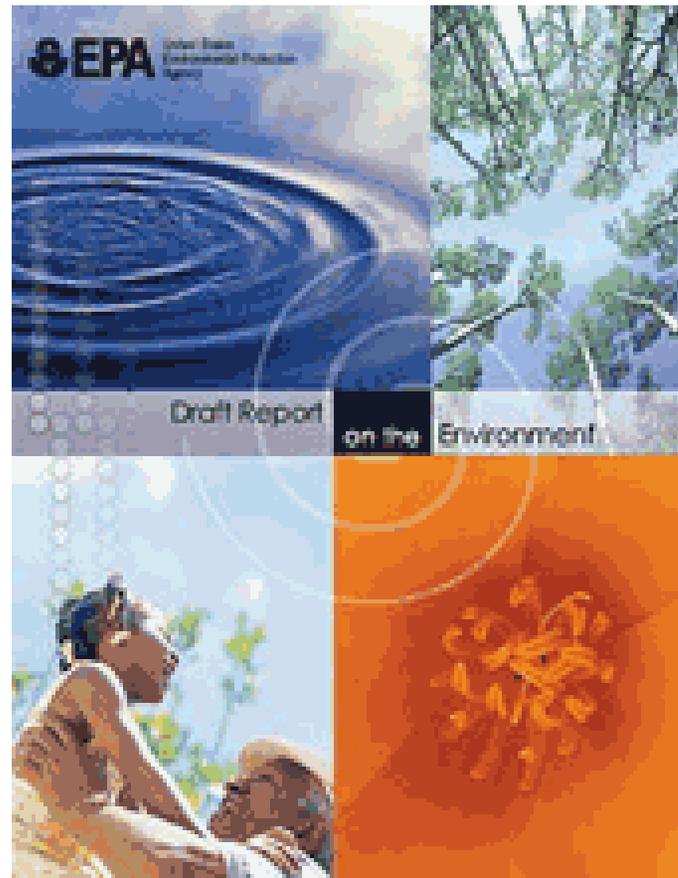
EPA-USGS-Delaware River Basin Research Cooperation

*Develop 20-year water resource
plan for sustainable use of
Delaware River Basin*



Track Progress Through Indicators

EPA's
Draft Report
On the
Environment
(2003)



Developing Market- and Incentive-Based Policy For Sustainable Development

EPA/ORD *Economics and Decision Sciences*
strategic research objectives:

- Ecological and Health Benefits Valuation
- Environmental (Compliance) Behavior and Decision-making
- Market Mechanisms and Incentives
- Benefits of Environmental Information Disclosure



Sustainability: System Domains

- **Ecosystems and Agriculture**
Managing and sustaining ecosystems across scales and media
- **Industry and Materials Flow**
Designing chemicals, materials, energy, and processes to be more benign, efficient, and effective
- **Healthy Communities and the Built Environment**
Planning and decision-making for healthy communities and sustainable regional and urban environments



Ecosystems and Agriculture: *A Case Study in the Great Lakes*

Opportunity:

- Protect largest fresh water system on earth; 18 % of world water supply
- Protect ecosystems and control industrial pollution
- Affect lives of 33 million people
- Achieve sustainable resource management

Approach:

- Analyze and synthesize satellite and ground based data
- Remediate geographic Areas of Concern
- Develop predictive models
- Great Lakes Regional Collaboration



Industry and Materials Flow:

A Case Study in Alternative Solvents

Opportunity:

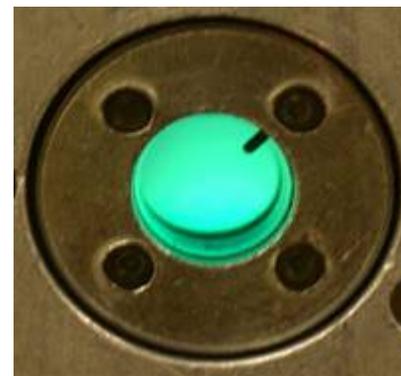
- The U.S. uses 3.5 M tons/yr of highly toxic, petroleum-based solvents.
- Solvents include 5 of the 10 chemicals with the most production-related waste.
- Solvents cause air emission and water pollution.
- The Clean Air Act and Clean Water Act regulate most solvents.



Approach:

Apply Green Chemistry and Engineering to ...

- Use supercritical CO₂ as a reaction and separation medium
- Carry out reactions in ionic liquids
- Use water and polyethylene glycol (PEG)
- Develop solvent-free processes



Healthy Communities and the Built Environment: A Case Study in Urban Redevelopment

Opportunity:

- Brownfields are abandoned or underutilized industrial or commercial properties
- Between 500,000 and 1 million brownfields exist in U.S. (EPA estimate)
- Potential environmental contamination and liability can hinder redevelopment

Approach:

Use grants, technical assistance, regulatory relief and stakeholder collaboration to support brownfields redevelopment:

- Remove environmental hazards from communities
- Relieve pressure to develop pristine open space and farmland
- Revitalize communities by creating jobs and increasing local tax bases



An Abandoned building within Salt Lake City's Gateway District.



A Redeveloped, now-thriving portion of Salt Lake City's Gateway District.

Interactions across System Domains: Global Earth Observation System of Systems (GEOSS)

GEOSS' continuing benefits for sustainability:

Understanding the Earth system—its weather, climate, oceans, land, geology, natural resources, ecosystems, and natural and human-induced hazards—is crucial to enhancing human safety and welfare, alleviating human suffering including poverty, protecting the global environment, reducing disaster losses, and achieving sustainable development.

S o c i o - e c o n o m i c b e n e f i t s

Disasters

Health

Energy

Climate

Water

Weather
forecast

Ecosystems

Agriculture

Biodiversity
Conservation

Promoting informed decision-making: Collaborative S&T Network for Sustainability (CNS)

Twelve pilot projects ...

- Exploring the use of science and technology in decision-making for effective use of resources in:
 - Ecosystems and agriculture
 - Industrial materials and energy flow
 - Communities and the built environment
- Focusing on regional priorities
- Encouraging collaborations among states, municipalities, non-profits, academic institutions

CNS: Selected Projects

(Collaborative S&T Network for Sustainability)



Capacity Building and Training the Next Generation



- EPA has launched the P3 (People, Prosperity, and the Planet) Award: A National Student Design Competition for Sustainability.
- EPA will support the evaluation of curricula in Engineering and Chemistry programs.
- EPA is supporting the role of colleges and universities as “learning environments” for sustainable practice.

Summary of EPA's Research Strategy for Sustainability

- Anticipating and preparing for future environmental challenges, including emerging technologies
- Developing new benign and resource-efficient processes, materials, chemicals, products and systems
- Developing decision-making tools and indicators for decision-makers
- Supporting collaborative problem-solving

